

25

In operation, the probe 400 can be inserted into a patient, preferably into an anchorable location, such as a collagenous tissue, bone, or vertebral disc. FIG. 36A illustrates the probe 400 being inserted into a patient (not fully shown) toward the spine (only a first vertebra 440, second vertebra 450, and disc 460 are illustrated in this representative example). The probe 400 illustrated in FIG. 36A is a thin, blade like rectangular probe 400 with a triangular anchor tip 430 and squared corners where the distal shoulders 420 meet the edges of the probe 400. The structure of the probe 400 can facilitate its passage through tissues of a patient which can run parallel to the flat surfaces of the probe. In operation, a physician can select a location in which he desires to use a retractor 10 to form an operative channel in the tissues of the patient (the spine will be used in this example for illustration purposes only). After the surgeon selects the location for retractor 10 placement, he can insert the probe 400 by placing the anchor tip 430 against the surface of the patient and applying pressure to the proximal end 413. The physician can then continue to apply pressure, thereby pushing the probe 400 through the tissue of the patient, until the probe 400 is fully in place. In some embodiments, an imaging modality can be used during the insertion of the probe 400. As a representative, non-limiting example, X-ray fluoroscopy can be used during insertion of the probe 400 to ensure correct placement. Any appropriate imaging modality can be used to monitor the placement of the probe 400. In some embodiments, a surgeon can make an incision with another instrument, such as a scalpel, prior to the insertion of the probe 400, into which the probe 400 is inserted.

FIG. 36B illustrates the probe 400 fully in place in a patient. The probe 400 has been inserted into the side of the spinal column (here defined by a first vertebra 440, a second vertebra 450, and the disc 460 between them). FIG. 36B illustrates the placement of the probe 400 in a location in which the anchor tip 430 can anchor the probe 400. As shown in FIG. 36B, the probe 400 has been inserted into the patient until the anchor tip 430 has sunk at least some distance into the disc 460 between the first vertebra 440 and second vertebra 450. The anchor tip 430 has sunk into the disc 460 up until the distal shoulders 420 of the probe 400. The distal shoulders 420 serve in this example to limit the possible insertion depth of the anchor tip 430 of the probe 400.

FIG. 36C illustrates a retractor 10 (as disclosed herein) and a placed probe 400. The retractor 10 has blades as disclosed above which, when in their close conformation, fit substantially closely around the probe 400. The blades of the retractor 10 can be any type of blade as described above, including but not limited to a comb style blade, a fan style blade, or a combination style blade.

FIG. 36D illustrates the retractor 10 and placed probe 400 of FIG. 36C where the blades of the retractor 10 in their closed conformation have been placed around the probe 400 and slipped down around the probe 400 into the channel already formed by the probe 400 in the patient, to the spine. FIG. 36D shows the retractor 10 still in its closed conformation and the blades still in their closed conformation such that the blades substantially closely enclose the probe 400. FIG. 36E illustrates the same retractor 10 of FIG. 36D where the retractor 10 has been engaged and the blades have been deployed (both as have been disclosed fully above) to pull open the incision formed by the insertion of the probe 400.

FIG. 36F illustrates the retractor 10 and blades in place prepared for physician access to the desired spinal location wherein the probe 400 has been removed for physician access. The probe 400 can allow a surgeon to easily and quickly insert a retractor 10 without cutting an incision all the

26

way to the surgery site prior to inserting the retractor 10 into the desired location to access the surgery site. Rather, the surgeon can quickly and easily insert the probe 400 into the desired location, anchor the probe 400 using the anchor tip 430 in the desired location, slip the blades of the retractor 10 around the probe 400, and then simply slip the retractor 10 into place at which point in time the retractor and blades can be engaged to open up the surgical site and the probe 400 may be removed.

In one embodiment, the probe 400 comprises at least one electrode, wherein the at least one electrode is capable of stimulating a nerve to provoke an electromyographic response in the nerve. FIG. 37C illustrates a probe 400 with an electrode 431 disposed at the distal end 412 of the probe 400 on the anchor tip 430. In some embodiments, only one electrode is used. In other embodiments, a plurality of electrodes can be used, including about 1-10 electrodes, about 2-8 electrodes, about 3-6 electrodes and about 4-5 electrodes. In some embodiments, at least one electrode can be disposed on the anchor tip 430. In some embodiments, at least one electrode can be disposed on the probe body 410. The electrode 431 can be allowed to any of the embodiments described herein.

In some embodiments, the probe 400 comprises an endoscope 499, wherein the endoscope 499 can comprise an imaging element 432 at the distal end 412 of the endoscope 499. In some of these embodiments, the endoscope 499 can be configured to both allow a surgeon to visualize the placement of the probe 400 as well as allow a surgeon to slide a retractor 10 down over the probe 400 and into place as described herein to create an operative channel. In some embodiments, the endoscope 499 can include an anchor tip 430. Such an endoscope can be applied to any of the embodiments described herein.

While preferred embodiments of the present invention have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided by way of example only. Numerous variations, changes, and substitutions will now occur to those skilled in the art without departing from the invention. It should be understood that various alternatives to the embodiments of the invention described herein may be employed in practicing the invention. It is intended that the following claims define the scope of the invention and that methods and structures within the scope of these claims and their equivalents be covered thereby.

What is claimed is:

1. A system for creating an operative corridor in a human body, comprising:

a probe, wherein the probe is configured to be placed through the tissues of a patient from the surface of the tissue to a location of interest;

a retractor system, wherein the retractor system comprises a blade assembly comprising a first blade rotatable about a first axis and a second blade rotatable about said first axis, the first and second blades having an internal space, wherein the internal space is substantially the same shape as the probe such that the internal space will slip over the probe when the probe is inserted into the tissues of the patient;

wherein the retractor system is configured to move the blade assembly in a direction generally perpendicular to the first axis the movement of the blade assembly being independently controllable from the rotation of the first blade and second blade.

2. The system of claim 1, wherein the probe has a circular cross-section.

3. The system of claim 1, wherein the probe has a rectangular cross-section.